# ON THE EFFECTS AND MEDICINAL USE OF COD LIVER OIL

BY E. POULSSON

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Many time-honoured remedies have been forsaken during the last decades because modern scientific research has been unable to prove their value.

The opposite applies, however, to the remedy treated in the present monograph. About one hundred years ago, cod liver oil, used by the Norwegian and Iceland fisherfolk from time immemorial as a sovereign remedy against many diseases and ailments, became known to the medical world, and it did not take long before it was very highly valued, although no satisfactory explanation for its activity could be given. Only the research of the last few years in fields hitherto entirely unknown has succeeded in supplying clinical experience with a solid experimental basis, and has thrown some light on the nature of the effects of the oil.

Cod liver oil is the liquid liver fat of the large sea-cod, Gadus Callarias, a deep-water fish occurring in the North Atlantic and in immediately adjoining sections of the Arctic Ocean. At certain definite times each year, this fish, in huge quantities, makes for the banks off the west coast of Norway in order to spawn. The advance guard reaches the coast already early in January, while the masses follow on a few weeks later. Spawning takes place in March and April. The cod becomes sexually mature in its sixth and seventh year, and can reach an age of about twenty years. These wedding trips have been made to the same place and at the same time for at least one thousånd years. Already in 930 mention is made in Egils Saga of cod fishing off the coast.

The original method of securing the oil was very primitive: the livers, cut out by the fishermen, were thrown into barrels or similar large receptacles, without being cleaned, where they were left. Submitted to the pressure, of their own weight the liver cells burst, or as the process of decomposition set in, split open — and this might take both weeks and months — and the oil poured out and was eventually drawn off. This oil was of a very yellow or brownish colour, had a bitter and often rancid taste, a strong odour of fish, and contained numerous products of decomposition of fat and proteids. This oil was replaced by steamed medicinal oil for medical purposes some seventy years ago. The steamed oil is prepared wholesale by taking the liver out of the fish as soon as it is caught, and removing the gall blader and all diseased parts. After a thorough washing, the livers are placed in boilers and heated by steam. During the course of but half an hour to an hour, the oil has run out, and after the solid fats have been removed by cooling and subsequent filtration, the resultant product is placed on the market as a light yellow oil with comparatively little taste and odour.

After also medical men had found cod liver oil to be a very valuable agent, the question of what caused its action was frequently raised, and answered in the most different ways. At first one tried to explain the matter by pointing to its small content of iodine or phosphorus. The gall substances were also stated to be of significance, and when French research workers discovered substances resembling alkaloids in the oil (due to the setting in of the decomposition process), attention was devoted to this for quite a considerable time. All these hypotheses had to be given up, however, when one began to use the new kinds of cod liver oil which are entirely innocent of these impurities, without any change in therapeutic results.

Subsequently it was discovered that, chemically, cod liver oil stands in a place by itself. In addition to the usual

kinds of fats, cod liver oil contains glycerites of peculiar non-saturated fatty acids, which are distinguished by the fact that they are easily oxidised and easily form fine emulsions. This resulted in the view that cod liver oil could not be considered as a medical agent in the proper sense of the word, but that it was more in the nature of a nutrient which was more easily absorbed by the human organism than other fats. This explanation was not looked upon as entirely satisfactory, however, as clinical experience proved over and over again that there must be something very special about cod liver oil, and that the many substitutes which had been tried, such as, for instance, vegetable oils, totally lacked the characteristic effects of cod liver oil in connection, for example, with rickets.

Experiments and investigations made during the most recent years have finally shown that the reason for the exceptional qualities of cod liver oil, and its therapeutic effects is that it contains two fat soluble vitamins in relatively large quantities, i. e. the anti-xerophtalmic or growth-promoting vitamin (Vit. A.) and the anti-rachitic vitamin (Vit. D) which are both essential for the normal growth and development of the body particularly in the early stages of life. If they are lacking in the diet, then it does not take long before characteristic deficiency symptoms develop, resulting shortly after in death. As far as is known to-day, the animal organism itself cannot produce vitamins. Their synthesis takes place in plants, whence they are transmitted to herbiverous animals, thus becoming available for carnivorous animals.

## I. THE ANTI-XEROPHTALMIC OR GROWTH-PROMOTING VITAMIN (VIT. A).

If young rats be placed on a diet which is complete in every way except in so far as it does not contain this vitamin, growth ceases after a few weeks, the graph plotting growth

remains horizontal for a short time, after which the weight of the animals begins to fall. The rats then become subject to a strange eye disease ending in blindness (xerophtalmy, keratomalacy), display less resistance towards infectious diseases, athrophy, and finally die.

Fig. 1. — Animals of the same age. To the left, normal diet with Vitamin A. To the right normal diet without Vitamin A: atrophy and eye-disease.

If sufficient quantities of the vitamin be given them in time, their condition rapidly improves, growth is resumed, and the disease is cured. The corresponding effects, both the defective symptoms owing to lack of Vitamin A, and the cure, thanks to the addition of Vitamin A, are also witnessed in the human organism. The eye-disease to which reference has already been made occurs in Asiatic countries (Japan) where cattle breeding is not carried on to any extent, where rice is the staple food, where milk is almost not used, and where vegetable oils take the place of butter. This eye-disease has, in the past, occurred only very rarely in Europe, but during the war years when food was scarce, it broke out in different countries. That it can become a serious danger has been realised in Denmark, where it has been a frequent cause of blindness for quite a number of

years. From 1909 to 1920 more than 600 cases of xerophthalmy occurred in that country. This may seem astonishing, in view of the fact that probably no other country has so much cattle, and produces so much butter, in relation to the population, as does Denmark. According to the

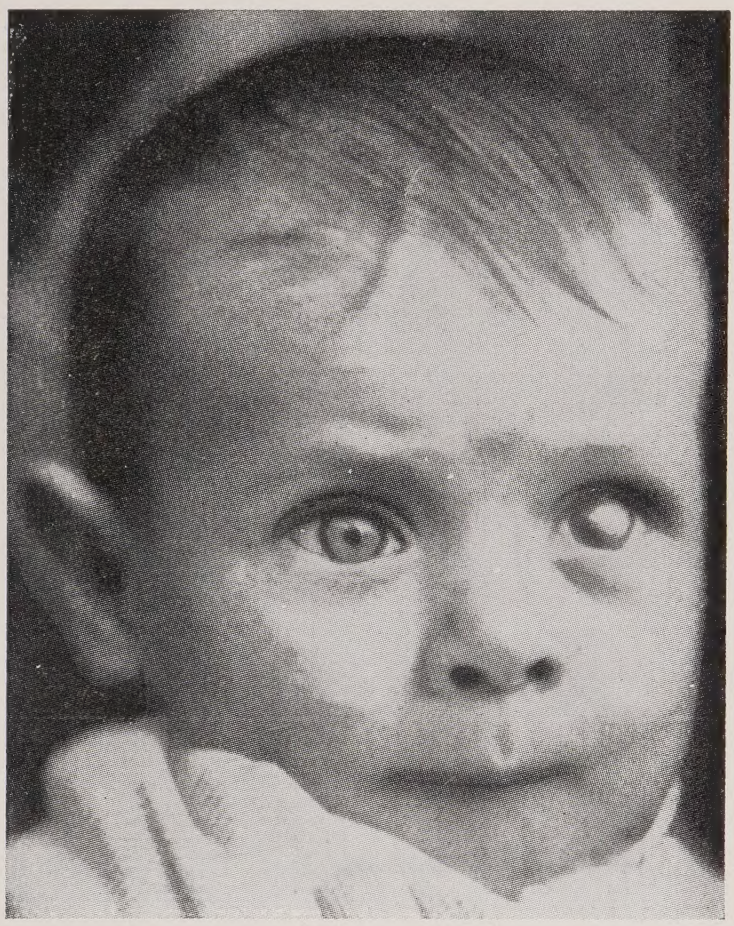

Fig. 2. — Xerophthalmicas. *C. E. Bloch,*
Pediatric Clinic of the University, Copenhagen.
Meddelelser, Vol. IV.

Danish ophtalmologist, Blegvad, the very obvious reason for this was that the fat content of the milk, the most important ordinary source of the vitamin, was exported in the form of butter, the country's own inhabitants getting only the separated non-fatty milk which was left.

Vitamin A is found in the green leaves of plants, in certain roots, in the germ and husks of corn and grain, also in small quantities in beef and in ordinary fat, but not in lard. It is almost entirely lacking in vegetable oils, and is present in abundant quantities in the physiological

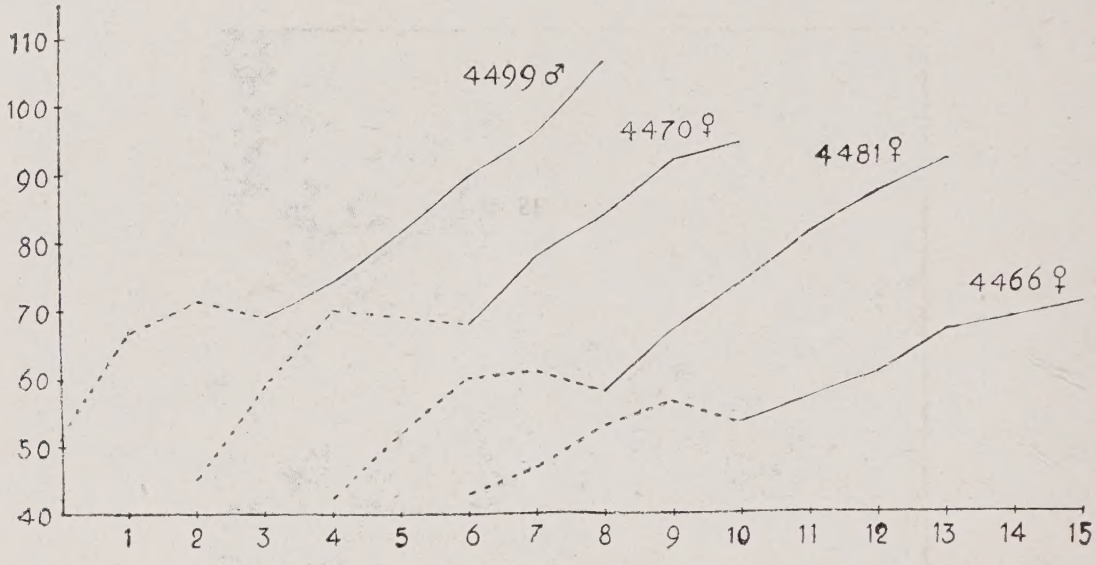


Fig. 3. — The dotted line indicates the preparatory period without Vitamin A; the straight line indicates the cod liver period. Dose: 2 milligrams per diem. The cod liver oil used is an average sample of Norwegian 1925 cod liver oil. The vertical row of figures indicates the weight in grams, the horizontal row the time in weeks.

products which are destined for feeding the young during the first period of its life, i. e. in eggs, in milk, and, hence, in butter, but above all in the various fish oils whose vitamin-content exceeds that of every other product which has hitherto been examined, both of the animal and vegetable kingdoms. In order to cure eye-disease in a rat, and to induce growth-resumption, a daily dose of about 250 milligrams of ordinary butter is required. A dose of only 2 milligrams — and even less — of the best types of cod liver oil achieves the same result.

## II. THE ANTI-RACHITIC VITAMIN (VIT. D).

The anti-rachitic effects of cod liver oil have been clinically noticed for quite a considerable time. By experiments on animals both its prophylactic and its curative influence becomes clear. It is concluded that this is due to a vitamin entirely different and distinct from the antixerophthalmic vitamin because, among other reasons, the latter occurs isolated in certain plants, such as, for example, spinach which even in small doses has a pronounced growth-promoting effect, but which, in the largest quantities which it is possible for an animal to assimilate, does not cure rickets. That one has two different chemical substances to deal with, may also be concluded from the fact that if air be run through heated cod liver oil, the growth-promoting influence disappears much more rapidly than does the anti-rachitic, which would seem to indicate that the latter must be a substance less sensitive to oxygen than the former. It must be added, however, that Vitamin A and D usually occur simultaneously. It may be of practical importance to note that milk and butter, particularly during the winter months, may be relatively deficient in Vitamin D. This, of course, depends upon the way the cows are fed. The anti-rachitic vitamin is also necessary for the growth of the body. Vitamin A alone is not adequate.

If rats be placed on a rickets-producing diet, the symptoms so well known among human beings, appear after a few weeks. The animals become sensitive to touch, their movements become clumsy, curvatures of the bones become noticeable, "rosary" develops and frequently pectus carinatum, and typical transformations may be seen to occur in the long bones. A broad, soft cartilage zone (the metaphysis) has orginated between the diaphysis and the epiphysis, in which ossification and calcification does not take place.

The prophylactic effects may easily be ascertained by chemical analysis showing that the ash content or

the lime content of the bones is too low and the water content too high in the animals suffering from rickets, and how this may be prevented by cod liver oil. In the subjoined table group I represents the experimental group which during the entire trial period of eight weeks were placed on a rickets-producing diet, while group II received in addition two milligrams of cod liver oil per diem during the whole period.

*Table 1.*

| Group 1. Experimentalgroup | | | Group 2 | | |
|---|---|---|---|---|---|
| No. | Water per cent | Calcium per cent | No. | Water per cent | Calcium per cent |
| 1 | 59.55 | 12.80 | 7 | 40.06 | 21.67 |
| 2 | 59.83 | 12 92 | 8 | 41.97 | 21.25 |
| 3 | 59.40 | 12 56 | 9 | 39.59 | 22.16 |
| 4 | 59.65 | 13.06 | 10 | 39.61 | 21.63 |
| 5 | 58.90 | 12.54 | 11 | 39 19 | 21.85 |
| 6 | 57.68 | 14.28 | 12 | 40.85 | 22.07 |
| | | | 13 | 40.25 | 21.80 |
| | | | 14 | 39.90 | 21.83 |
| Average | 59.17 | 13.13 | Average | 40.18 | 21.78 |

Table 1. — Group 1. Six experimental animals have been given Mc. Collums diet 3143 for some weeks. Group 2. Eight other animals received the same diet plus 2 milligrams of cod liver oil per daily.

The curative effect appears very rapidly even with animals suffering very seriously from rickets. If somewhat large doses of cod liver oil be given, already after some days lime deposits may be found in the metaphysis by the clever "lime test" introduced by Mc. Collum and his associates. This lime test consist of treating a longitudinal section of the tibia with a silver nitrate solution which is then exposed to the light just like a photographic plate. The silver is

precipitated upon those sections where the lime deposits have begun to form and appears in the shape of dark lines or dots. X-ray photographs are also very useful in this connection and have the great advantage that they make it possible to demonstrate in one and the same animal pronounced rachitic symptoms and the subsequent beginning of the cure. Already a few days treatment with about 4 milligrams of cod liver oil per diem is sufficient to bring out shadows of the ossification process in the metaphysis.

## III. COD LIVER OIL AND ULTRA VIOLET RAYS.

That unknown substance regulating the phosphorus content of the blood, the lime content and lime deposits in the bones and now known as Vitamin D, has attracted a great deal of attention both because rickets is a serious disease which occurs frequently and because investigations pursued during the last couple of years have brought results which theoretically also are of the utmost interest. They now permit us to catch a glimpse of the intimate connection between the two methods of treatment which experience has established.

Broadly speaking, rickets occurs somewhat as follows: the disease is frequent in the temperate zones, particularly in the lowlands, but very rare (and in some places almost unknown), in the Arctic regions, in the Tropics and in mountainous territories. Many a hypothesis has been submitted regarding its causation and many methods of treatment have been put forward. During the most recent years, it has been recognised that treatment by sunlight or by ultra-violet rays as well as by vitamin therapy as represented by cod liver oil, both of which methods at the first glance appear so widely different, are the only undubitably effective ones. In this way light is shed upon the curious geographic incidence of the disease formerly so difficult to explain. In all Arctic countries fish products rich in vitamins

play a very important part in the diet. The cold, high-mountain regions and the warm tropics have intense sunlight in common. A very large proportion, it is said up to 99 %, of the ultra-violet anti-rachitic rays do not penetrate the dust-containing air-belt which stretches for several hundred metres above the lowlands.

That it is not race immunity which protects Africa's and other coloured populations transpires from the fact that negro children in temperate countries, for instance in the U. S. A., are much more subject to the disease and suffer much more seriously from it than do white children. This can only be explained by the fact that their dark skins, suitable for naked existence in the Tropics, act like a black screen in keeping out the ultra-violet rays. That there can be no question of race-immunity transpires also very clearly from Hutchison's experiences in certain districts in East India. In these districts the wives and children of the wealthy, must, of religious grounds, remain within the four walls of their dark residences during the first year, while poor mothers with their babies move about freely in the open air. In both cases, the children are fed upon mother's milk during the whole of the first year. Hutchison found that 24.9 per cent of the children of the wealthy suffered from rickets, while only 4.8 per cent of the children of the poor suffered from this disease. Better proof of the importance of sunlight against rickets can hardly be asked for.

The active substances may easily be extracted from cod liver oil in a very concentrated form. In principle the method is very simple. Cod liver oil, like other fats, consists of fatty acids and glycerine. If it be boiled with an alcoholic solution of caustic potash one obtains soaps, free glycerine, and in addition a small remainder, about 0.5 per cent, which is non-saponifiable. This last, which contaims the entire active substance, forms a semi-solid butter-like substance after removal of the soaps and the glycerine. If this be allowed to stand for some time it becomes studded

with scintellating crystals consisting of cholesterol, a mono=valent saturated high=molecular alcohol, which among human beings and animals occurs in the most various, perhaps in all, tissues and organs, and particularly profusely in the brain and nerve systems, in the vitellus, in sperm and in the skin, whose fats to a very large extent con=sist of the cholesterolesters of the ordinary fatty acids. If the cholesterol be removed from the unsapowiable fraction, a yellowish oil is left, of which 90 per cent consists of other high=molecular alcohols and 10 per cent of carbohydrates. If these also be removed, there remains and exceedingly small quantity of a yellowish oil which is very active (a daily dose of 0.003 milligrams promotes growth) and which can be distilled in a high vacuum with=out losing its activity. This, combined with its resistance to such forcible interference as boiling with caustic potash (saponifying), would seem to indicate that the active substances are very resistant and comparatively simple com=pounds whose isolation must one day be brought about. For the time being the task is yet unsolved.

If rachitic rats be irradiated, their cure soon begins. It is not, however, necessary directly to treat the animal, and it is sufficient to irradiate its food, above all the fats (Steenbock & Black, Hess & Weinstock). If an originally inactive vegetable oil, e. g. ordinary olive oil, be exposed for about an hour to the mercury quartz lamp, it becomes anti=rachitic and it maintains this quality for as long as we have hitherto been able to keep it under observa=tion, namely at least one year. In other words, a lasting chemical change has taken place, and if this olive oil be saponified, then one again discovers the entire activity in the unsapowifiable fraction section consisting mainly of cholesterol. The next step is to irradiate the pure cholesterol. This substance too, which of itself is entirely inactive, be=comes active, has a very anti=rachitic effect, and shows itself to have changed both chemically and physiologically. At

this point, of course, the thought strikes one that one might in this way be able to produce a pure vitamin and finally to arrive at a conclusion regarding its chemical nature. Up to the present, however, this has not succeeded, and it seems clear that we are faced with very complicated reactions. If the irradiation be stretched over too long a period, the cholesterol again becomes inactive. Even cod liver oil becomes inactive after having been subject to the mercury lamp for thirty hours. A number of searching tests have been made which show that it is only a definite portion of the ultra violet spectrum which is useful, i. e. rays of a wave length of 300.[1]) In conformity herewith Sonne & Schultzer at the Danish Finsen Institute have found that rays of about the same wave length are the effective ones in treating rickets among human beings.[2])

All these tests are so recent that the final results cannot yet be surveyed. Even if they do not lead further or help towards the discovery of the chemical nature of the vitamin, they are at all events, of very great interest. They show in the test-tube what occurs in nature on a large scale. Here, as in nature, the short rays of the sun, invisible to our eyes, with their chemical action, are the source of vitamins, and we are now beginning to catch a glimpse of the connection between these two effective methods of treatment, cod liver oil and ultra violet rays. These are, in reality, the same therapy, but in two entirely different forms. By the ray treatment the vitamin originates in the skin of living human beings or animals. Experimental proofs are available; if rats be irradiated and killed and rachitic rats be given the skins to eat, they are cured. If one gives them cod liver oil, the process is analogous although in a more roundabout way. Early in the spring when the sun begins to grow in strength, the sea water is filled up with in-

[1]) = 1/1 000 000 of a millimeter.

[2]) Recently it has been shown by Windaus that it is not the cholesterol itself which is being activated, but a related substance, *Ergosterol*, which in small quantities occurs in cholesterol preparations.

numerable vegetable organism, i. e. vegetative plankton, which rises to the surface and is made active by the light. It is only for a very short time, however, that we find testae or colouring matter from algae in the intestinal canal of the fry. Later, the fish cease to be vegetarians. From the vegetable matter the vitamin is first transferred to the masses of lower animal organism, i. e. animal plankton which is consumed by the fish either directly or indirectly in such a way that the larger fish successively consume smaller fish down all the grades. In this way the vitamin finally gets into the liver of the fish, is transferred to the roe, and is used by the fry. But here we interfere, extract the active fats from the liver and use them for human children. This is a long way round, but practical for us. Cod liver oil may be obtained everywhere, while ultra violet rays are not so easily to be secured, and cod liver oil has furthermore the very great advantage of being much cheaper than ultra violet ray treatment.

## IV. INDICATIONS FOR THE MEDICINAL USE OF COD LIVER OIL.

Daily experience would seem to indicate that the healthy adult does not stand very greatly in need of the two fat-soluble vitamins treated above, and that such requirements are completely covered by the ordinary daily mixed fare even if butter be replaced by margarine, which has the same food value and has the advantage of being much cheaper.

These two vitamins, however, can probably not be entirely dispensed with even by adults. According to Drummond, adult rats in whose dietary these vitamins were lacking did not get on as well as the control animals: after about 140 days they got an eye disease and died during the course of some months, most of them on account of lung disease.

As regards the use of cod liver oil in the case of adults, it may generally be said that where great demands are made upon the maintenance and new formation of tissues, e. g. in the case of wasting diseases, those who are emaciated or convalescents, it may be of importance to remember the growth-promoting qualities and to add certain foods to the diet which are rich in vitamins, such as for example, eggs, milk, butter, cod liver oil — a result which experience has arrived at quite a long time ago. Cod liver oil is often strikingly useful in the case of chronic bronchitis. In addition to its vitamin content, cod liver oil also has this quality that in only a small volume it supplies the body with large quantities of combustial material, as the oil as a fat generates much heat on combustion, and in addition is free from water, while most other foods contain 60 to 70 per cent of water. A spoonful of cod liver oil yields about 120 calories; three spoon fuls daily yield about 360 colories, which is a very important portion of the daily requirement.

The opinion of medical men regarding the importance of cod liver oil in the treatment of tuberculosis has varied very widely. While previously almost specific effects were ascribed to it, later in strictly bacteriological reasoning it was stated to be of significance solely as a fat. Rogers, Lindenberg and Pestana have discovered that cod liver oil (probably its peculiar acids) acts as a poison on certain acid resisting bacilli, e. g. lepra and tuberculosis bacilli. If it would have this effect if applied in the usual way, and if it would reach the bacilli in the tissues, must be said to be doubtful.

*But when we come to children, the question of vitamin requirements is entirely different from that obtaining in the case of adults.* As long as the child gets mother's milk, it receives a sufficient supply of vitamins, but the difficulty arises when it is weaned. The usual food consumed by adults cannot be used, the delicate digestive organs restrict one's choice, and the danger of giving the child too much

farinaceous foods is very great. During this period margarine as the only or main source of fat is entirely out of place. During their first years of life, children need unskimmed milk, butter, vegetables, eggs, and cod liver oil can often be of the greatest use. It is usually stood very well, and is distinguished by the fact that a teaspoonful daily contains much more vitamins than even the largest quantities of milk and butter which can be consumed. Furthermore milk and butter are relatively poor in the antirachitic vitamin.

The ailing condition of children, which is the surest indication that cod liver oil may be useful, is *the cessation or retardation of growth*, scrofula and anemia. The pale, thin and weedy children of whom one sees altogether too many in the large towns, frequently fall a very easy prey to different infectious diseases, such as bronchitis, broncho-pneumonia, diarrhea etc. Here cod liver oil frequently has an excellent effect, not because of any direct antiseptic influence, but by increasing the powers of resistance of the body. Many pediatric clinics now systematically give all babies a small dosis, e. g. a teaspoonful of cod liver oil per day.

Special reference should be made to *rickets*. It has already been pointed out in a previous sectoin that cod liver oil has a preventive effect against rickets in experimental animals. That it has a prophylactic effect on human beings has recently been demonstrated in a very conclusive fashion by Hess & Unger, who have compared their experiences in the following table:

| Total quantity of cod liver oil | Length of treatment | No. of children | No. who did not get rickets | No. who got rickets | Percentage non-rachitic |
|---|---|---|---|---|---|
| 1640 ccm. | 6 months | 32 | 30 | 2 | 93 |
| 640 » | 6 » | 5 | 4 | 1 | 80 |
| 630 » | 4 » | 12 | 7 | 5 | 58 |
| 0 » | | 16 | 1 | 15 | 6 |

The treatment began at an age of between 4 and 12 months, the result being that of the 32 children who in 6 months were given about one dessert spoonful of cod liver oil daily, 30 or about 93 per cent remained healthy. With smaller doses and shorter treatment, the results became constantly less satisfactory, and of the 16 children who did not get cod liver oil, only one was spared.

In many cases it will probably pay to go even further back than to the sick child. The vitamin content of mother's milk is entirely dependent upon the food. Human beings like animals cannot produce vitamins. The woman is but an agent transmitting the vitamin and therefore must have plentiful supplies when she is to feed her child. The author of these lines once had the opportunity of making an experiment of this kind.

In a family where economic limitations made unskimmed milk and butter into rarities, the mother, who was some 39 years of age, had nine children, of whom most bore clear traces of rickets. The tenth child was born on January 11th, 1922, and weighed 3 500 grams at birth. Eighteen days old its weight had only increased by 50 grams, the next 15 days it stood entirely still, the child's appearance was flabby, and there was some tendency to diarrhea. The mother's milk had a normal fat content. She was now given one tablespoonful of cod liver oil three times daily, and the child began to grow at once (fig. 4). Fifteen days later she was also given unskimmed milk and butter ad libitum, but this caused no additional change; what was required had been obtained through cod liver oil.

*That a case of rickets is treated or prevented also has a very important prophylactic effect.* Anxiety regarding the poor condition of teeth is very general among medical men who have anything at all to do with children in the age when they are to begin school. Complaints are now made in all civilised nations, particularly in the U. S. A.

In 1921, Buttler fond among 7 059 children 16151 cavities in the teeth, and here fillings which had already been carried out are not included. About 30 per cent of the children had their teeth in a partly wrong position, and the jaw bone was badly developed. Mc. Collum, from whose well known book "The newer knowledge of nutrition" these figures are taken, maintains that from the standpoint of

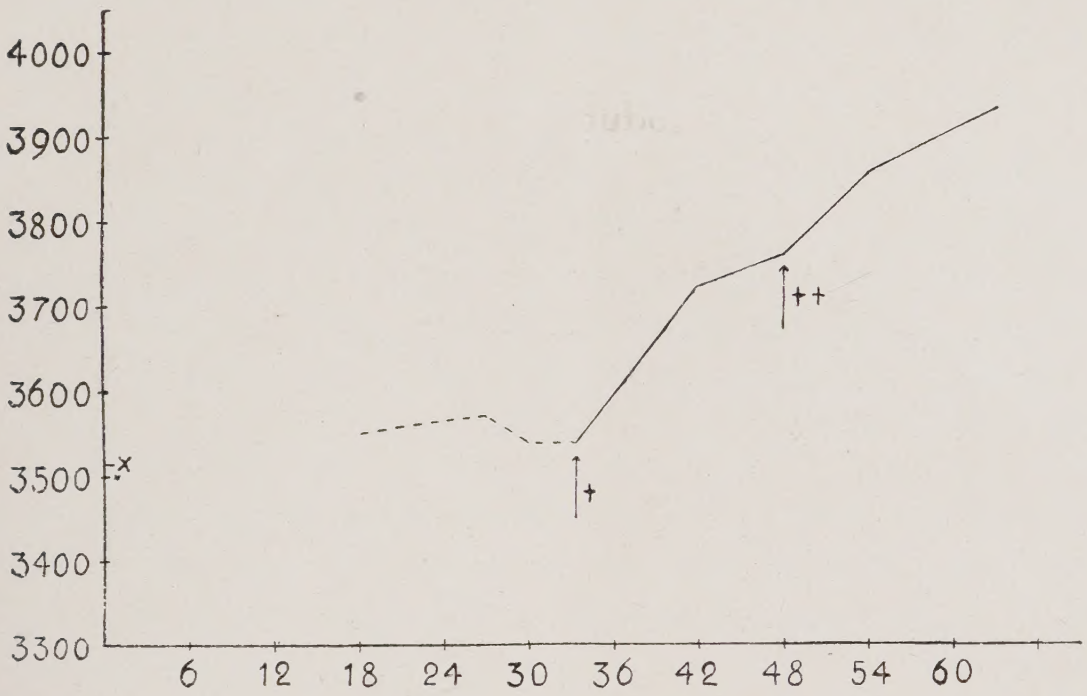


Fig. 4. — A six-week old child has ceased to grow. Growth resumed as soon as mother has been given cod liver oil (transfer of the vitamins to the milk). The vertical row of figures shows weight in grams, the horizontal row the time in days.

public health there is hardly anything which now demands closer attention than this. From other countries also it is reported that perfectly healthy teeth is a rarity among children between 6 and 7 years of age. The main cause of dental caries is rickets, due to the fact that children's food in civilised nations is prepared in such a way that it either entirely or almost entirely lacks the vitamin which, in a way unknown to us, regulates the mineral metabolism i. e. the absorption and depositing of calcium and phos-

phorus. Even if these are adequately present in the food, they cannot be utilized if the vitamin be lacking. The phosphorus content of the blood sinks to about half or less of the normal. One is tempted to call this the fundamental symptom of rickets, just as characteristic for this disease as blood sugar for diabetes. The consequences are the well known defects of the bones and, as regards the teeth, a thin and poor enamel as well as a poorly developed root, both of which unavoidably cause dental caries.

Whether cod liver oil contains other vitamins than those mentioned above is not definitely known. Several American authors — Bishop, Evans, Sure and others — have shown that there is still another fat-soluble vitamin which has been called Vitamin E or the anti-sterility vitamin. This vitamin occurs in many plants, but not in cod liver oil, and great importance is attached to it for the normal course of reproduction. If rats are placed on a diet where this vitamin is lacking, the testes atrophy and the males become definitely sterile. The females are affected in a different way. If they are mated with normal males, conception occurs but the embryo dies in the uterus when about half of the normal period of gestation is expired, and is reabsorbed. In other words, they do not give birth to living young.

It is unknown whether the same thing occurs among human beings, i. e. if the lack of a certain vitamin causes sterility or the death of the fetus. The thought lies near at hand, however, that these two cod liver oil vitamins which are of such importance to the child during its early life after birth, may also be of importance for its intra-uterine life. The following observation may be explained in this fashion:

It concerns a 34-years old woman, whose life the author of these lines has had the opportunity to follow since childhood. She has never suffered from any serious ailment

and her whole appearance is that of a healthy and well developed woman. At twenty years of age she was married and has shown herself to be well capable of conception, but pregnancy has been interrupted many times by the death of the child in the uterus followed shortly thereafter by its birth. According to her own statement she has almost felt better during pregnancy than at other times and in particular her appetite has been greatly increased. She herself diagnoses the death of the fetus by the cessation of its movements, while at the same time her appetite disappears entirely. It should be added that during every pregnancy she has been examined by an expert specialist who could not demonstrate anything abnormal in her condition. The fetus have several times been subjected to pathological-anatomical examinations, without anything else being discovered than ordinary atrophy, i. e. no specific ailment.

The patient's experiences in married life may be indicated as follows:

1) 1912, birth at full term, weight of child 3500 grammes, well developed, living,
2) 1913, birth at full term, weight of child 2750 grammes, living,
3) 1915, birth about two weeks too early, child died 3—4 days before birth, 3000 grammes,
4) 1916, birth 8 weeks too early, child dead one week before, 2000 grammes,
5) 1918, birth about one week before normal time, child dead 6 days before birth, 2750 grammes,
6) 1919, premature birth artificially provoked a fortnight before full term at patient's own request, child's weight 2000 grammes, very weak, "about dead", but was kept alive, is still alive, but very weak,
7) 1920, birth 2 weeks before normal time, child dead 8 days before birth, 2750 grammes,

8) 1922, cod liver oil one tablespoonful three times daily from the 4th month, artifially provoked birth at patient's own wish (owing to her anxiety for the state of the child) 14 days before full term, weight 3250 grammes, living, healthy,
9) 1925, cod liver oil from 4th month, birth at fuel term, weight 4500 grammes, living, strong.

We have here in a short summary, particulars of an apparently normal woman, who first gave birth to a strong child of normal weight; the second time the weight at birth had fallen considerably, after which follow a number of pregnancies which end up by premature birth (dead fetus). No. 6 must also be considered in this light as one may definitely conclude that it is only medical interference which prevented this child from sharing the fate of the others. After cod liver oil treatment from the 4th month the woman again has healthy children of normal weight.

The author is well aware that one case of this kind is by no means sufficient evidence. One may conclude, however, that it will be well worth our while to try this harmless treatment in the case of habitual abortions without the mother's suffering from any demonstrable disease.

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